U. S. Department of Agriculture
Agricultural Research Service
Southern Utilization Research Branch

PUBLICATIONS AND PATENTS

U. S. CITRUS PRODUCTS STATION

WINTER HAVEN, FLORIDA

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the U. S. Citrus Products Station

(Revised May 1956 by Marie A. Jones)

SUBJECT INDEX
(By Item Number)

Southern Utilization Research Branch
U. S. Citrus Products Station

SOUTHERN UTILIZATION RESEARCH BRANCH

Made up of laboratories of the Agricultural Research Service of the U. S. Department of Agriculture, the Southern Utilization Research Branch is engaged in research on utilization of crops grown in the Southern Region, comprising Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas. Headquarters for the Branch are located at:

Southern Regional Research Laboratory
1100 Robert E. Lee Boulevard
New Orleans 19, Louisiana

This laboratory conducts research on utilization of cotton, cottonseed, rice, tung, peanuts and other oilseeds, sugarcane, and sweetpotatoes, and on fundamental chemistry and process engineering and development applicable to utilization of these products. Field stations are:

Sugarcane Products Laboratory, Houma, Louisiana
Tung Oil Laboratory, Bogalusa, Louisiana
Naval Stores Station, Olustee, Florida
Citrus Products Station, Winter Haven, Florida
Food Fermentation Laboratory, Raleigh, North Carolina
Fruit and Vegetable Products Laboratory, Weslaco, Texas

For information on any of the lines of research being conducted in the Southern Utilization Research Branch, you are invited to write or visit the Southern Regional Research Laboratory, or the field station immediately concerned with the product in which you are interested.

U. S. CITRUS PRODUCTS STATION
Winter Haven, Florida

The U. S. Citrus Products Station was established in 1931 in response to the urgent need for research to develop processed products and by-products which would afford profitable outlets for surplus or cull fruit from Florida's growing citrus industry. Efforts during the first ten years of the Station's existence placed major emphasis on problems of canning single-strength orange and grapefruit juices. During that period, however, some attention was also given other citrus products, recovery and utilization of byproducts, utilization or disposal of processing wastes, and utilization of a few of the other subtropical fruits of the area.

Shortly before entrance of the United States into World War II, emphasis in research was shifted to national defense and war work. Beginning in 1942 the program was augmented by participation of the Florida Citrus Commission under a cooperative agreement by which from three to five Research Fellows of the Commission were assigned to the Station for five years, up to 1947. Among the projects receiving particular attention were citrus concentrates, problems in substitution of glass for tinplate in canning citrus products, continued investigation of off-flavor in processed citrus juices, microbiological problems, production of powdered orange juice, processed tangerine and lime products, and pectin concentrates, and disposal or utilization of cannery wastes. Limited attention was also given a number of commodities other than citrus.

Since 1945 primary attention has been given to persisting old problems, and to new problems developing with the expansion of the citrus processing

industry, particularly production of frozen concentrate. More and more emphasis has been and is being placed on development of fundamental information, which is becoming increasingly important to the intelligent study of problems in maintaining consistently high quality and stability of citrus juice products.

From the beginning, the program of the Citrus Products Station has involved sustained close contact and at least informal cooperation with industry and appropriate agencies of the State of Florida. Articles and patents presenting the research accomplishments of the Station and cooperating agencies from its establishment through 1955 are contained in this list of publications.

103. GROWTH RATES OF LACTOBACILLUS AND LEUCONOSTOC SPECIES IN ORANGE JUICE AS AFFECTED BY pH AND JUICE CONCENTRATION.
Rushing, N.B.; Veldhuis, M.K.; and Senn, V. J.
Appl. Microbiol. 4(2): 97-100. 1956.

Growth rates were determined for eight strains of spoilage bacteria in orange juice at concentrations from 12° to 42° Brix and pH from 3.4 to 4.0. Growth rates increase with increasing pH and decrease with increasing concentration. The most rapid growth rate observed corresponds to a generation time of 1.4 hours. This rate is insufficient to explain the development of significant numbers of organisms during the brief time concentrate is in an evaporator. Development of organisms in static pockets or films is a possibility.

102. *STABILITY OF FROZEN CONCENTRATED ORANGE JUICE. I. THE EFFECT OF HEAT TREATMENT ON ENZYME INACTIVATION AND CLOUD STABILITY OF FROZEN CONCENTRATE MADE FROM PINEAPPLE AND VALENCIA ORANGES.
Guyer, R.B.; Miller, W. M.; Bissett, O.W.; and Veldhuis, M.K.
Food Technol. 10(1): 10-16. 1956.

The effect of heat treatment on pectinesterase inactivation and cloud stability in frozen concentrate from Pineapple and Valencia oranges is reported. Various times and temperatures of heating were employed. Temperatures of 150° F. and above reduced pectinesterase activity substantially and delayed loss of cloud. There was a pronounced increase in cloud stability as the temperature was raised to 170° and 180° F. without a corresponding decrease in pectinesterase activity, indicating that some factor other than the enzyme is important in cloud stability.

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* In cooperation with Continental Can Co., Chicago, Illinois

101. CHANGES IN COMMERCIAL FROZEN ORANGE CONCENTRATES STORED AT SEVERAL TEMPERATURES.
Kew, T. J.
Fla. State Hort. Soc. Proc. 68: 167-170. 1955; Citrus Indus. 37(4): 10-13. 1956.

Commercial frozen orange concentrates were stored for periods up to three years at temperatures from 35° F. to -4° F. The average time required in storage for the cloud density to decline to half its initial value was two days at 35°, five days at 20°, 42 days at 15°, 361 days at 10°, in excess of 600 days at 5° F. At -4° F. storage temperature this cloud value was never reached. Gelation followed a similar pattern. Flavor and Vitamin C retention were excellent at -4° F. storage temperature after three years.

100. A PROPOSED STANDARD FOR DESIGNATION OF "CLOUD" IN CITRUS JUICES.
Senn, V.J.; Murray, M.D.; and O'Connor, R. T.
USDA Agr. Res. Serv. ARS-72-8, 11 p. October 1955. Processed.

Partial loss of cloud is considered one of the first indications of deterioration in citrus juices, and standards for the uniform designation of degree of turbidity are proposed in this publication. Commercial 325 mesh bentonite in a dilute solution of ammonium chloride is used for the standards for calibration of colorimeters intended for cloud determination. Details of the method, including preparation of standards, transmittance tables, bentonite equivalents of colorimeter dial divisions, and the designation of cloud values in terms of bentonite are given.

99. FROZEN GRAPEFRUIT, TANGERINE, AND LIMEADE CONCENTRATES.
Veldhuis, M. K.; Scott, W. C.; and Griffiths, F. P.
Food Technol. 9(4): 198-201. 1955.

The principal properties and problems of frozen grapefruit, tangerine, and limeade concentrates are discussed. Grapefruit

concentrates are somewhat lacking in cloud stability, therefore heat treatment is used. Tangerines are fragile, irregular in shape, and present problems in juice extraction and finishing. Lime juice may be merely sweetened in the preparation of concentrate for limeade or more concentrated products may be prepared by evaporation under low pressure and reinforcement of flavor with puree. Satisfactory frozen concentrates have been commercially prepared from all three types of fruit. Results of laboratory analyses are given for nine samples of grapefruit, three of tangerine, and eight of limeade concentrates.

98. EFFECT OF CARBON DIOXIDE AND CERTAIN OTHER CHEMICALS ON THE KEEPING QUALITY OF SINGLE STRENGTH AND CONCENTRATED ORANGE JUICE.
Morgan, D. A.; Rushing, N. B.; and Miller, W. H.
Fla. State Hort. Soc. Proc. 67: 166-170. 1954.

Fresh flavor and cloud were not retained, and pectinesterase activity was not inhibited in samples treated with carbon dioxide under 120 psi pressure, 250 ppm sulfur dioxide, 0.1% sodium benzoate, or 510 ppm monochloracetic acid when stored at 40°, 60° or 70° F. Microbiological activity was retarded at 40° F. in all samples except those treated with monochloracetic acid, at 60° F. in all treated samples of concentrated juice, and at 70° F. in samples of concentrated juice treated with carbon dioxide or sulfur dioxide.

97. CONTROLLING FOAM IN SUBMERGED AND AERATED PROPAGATION OF MICROORGANISMS.
Gordon, Willis O.; and Veldhuis, Matthew K.
U. S. Patent No. 2,635,070; April 14, 1953.
(Available from U. S. Patent Office, Washington 25, D.C., 25¢ per copy)

A continuous process of propagating microorganisms is described. A liquid nutrient is aerated in tanks from which air and foam

are discharged from a large-diameter pipe near the top and nutrient is discharged separately from a smaller pipe near the bottom. Foam-forming nutrients can be used without anti-foaming agents.

96. PASTEURIZATION AND STORAGE OF SWEETENED AND UNSWEETENED LIME JUICE.
Bissett, O. W.; Veldhuis, M. K.; and Rushing, N. B.
Food Technol. 8(3): 136-138. 1954.

Experiments have shown that during production of canned lime juice sufficient heat treatment to inactivate pectinesterase enzymes and destroy bacteria is desirable, and that refrigerated storage of the canned juice favors retention of highest quality. Sweetened and unsweetened lime juices were heated to temperatures ranging from 120° F. to 200° F., and tested for stability in storage at 35° F. Effects of the treatments were judged on the basis of bacterial counts, flavor, destruction of pectinesterase, and cloud stability; 150° F. reduced microorganisms to a low level, but 170° F. was required to destroy pectinesterase and insure cloud stability in 35° F. storage. Refrigerated heated products retained flavor practically unchanged for 15 months, but some changes occurred in unheated samples. At 80° F. all samples deteriorated rapidly.

95. LIME JUICE SUPERCONCENTRATES.
Bissett, O. W.; Veldhuis, M. K.; and Scott, W. C.
Food Engin. 26(6): 56-57, 190, 193-194. 1954.

Procedures for processing lime juice superconcentrates from which limeade of true flavor can be prepared have been developed

and pilot-plant-tested. Greatest advantage is saving in space, without loss in flavor. The products are an 8-fold, sweetened concentrate, requiring only water for reconstitution, and 35-fold unsweetened concentrate needing addition of sugar and water. Equipment required is already on hand in plants.

94. EFFECT OF CONCENTRATION OF ORANGE JUICE AND TEMPERATURE OF STORAGE ON GROWTH AND SURVIVAL OF MICROORGANISMS.
Rushing, N. B.; Patrick, R.; and Veldhuis, M.K.
Fla. State Hort. Soc. Proc. 66: 281-286. 1953.

Samples of concentrated orange juices of 40° to 70° Brix, in 5° steps, were stored at 35°, 50°, and 60° F. for 168 days and examined periodically. No cans of concentrated juice of 50° Brix or higher swelled in 35° storage, but at 50° and 60° F. swells were observed at all concentrations below 70° Brix. Yeasts were the main spoilage agents, except for 40° Brix samples stored at 50° F., where high counts of slime and gum-forming bacteria were also found in swelled cans. Coliforms were found in 40° through 65° Brix juices when prepared, but after 6-day storage they were found only in 40°, 45°, and 50° Brix concentrates at 35° F.; and 40° and 45° Brix concentrates at 50° F.; after 14-day storage, none were found.

93. NOTES ON FACTORS ASSOCIATED WITH GELATION IN FROZEN CONCENTRATED ORANGE JUICE.
Huskins, C. W.; and Kew, T. J.
Fla. State Hort. Soc. Proc. 66: 254-258. 1953.

To gain a better understanding of the causes involved in the gelation of commercial frozen orange concentrate when stored at temperatures above 0° F., the relation between pectin-esterase activity and pectin content in commercial frozen

orange concentrates has been studied. Samples of orange concentrate obtained from 4 citrus-processing plants during the 1950-51 canning season and from 6 plants at the beginning and end of the 1951-52 season were analyzed. The data indicate that gelation is related to the pectinesterase activity; as it increases, tendency towards gelation increases.

92. STORAGE CHANGES IN THE PHOSPHORUS, NITROGEN, AND FATTY ACID CONSTITUENTS OF THE LIPID IN CANNED FLORIDA VALENCIA ORANGE JUICE.
Huskins, C. W.; and Swift, L. J.
Food Res. 18(4): 360-363. 1953.

During the storage of orange juice at room temperature, there was a considerable loss of nitrogen from the lipid fraction over a period of one year -- particularly severe with choline nitrogen. Also noted was a loss of approximately half of the phosphorus, most of it during the first 6 months. There was an overall increase in the percentage of fatty acids because of loss of those portions of the phosphatides associated with the nitrogen and phosphorus. The only other noteworthy changes in the fatty acids were a decrease in iodine value and a slight increase in diene conjugation.

91. *STUDIES ON THE RECOVERY OF ESSENCE FROM FLORIDA ORANGE JUICES.
Morgan, D. A.; Veldhuis, M. K.; Eskew, R. K., and Phillips, G. W. M.
Food Technol. 7(8): 332-336. 1953.

A system for recovering water-soluble essences of orange juice under vacuum at temperatures of 110-115° F. is described. The

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* In cooperation with Eastern Utilization Research Branch, Agricultural Research Service, USDA, Philadelphia, Pa.

orange juice is not noticeably deteriorated at this temperature. A relation is shown between aroma of the essence and peel oil content. The use of water-soluble essence enhanced the floral character of freshly prepared concentrate and reconstituted product.

90. CHANGES IN THE LIPID FRACTION OF VALENCIA ORANGE JUICE DURING PASTEURIZATION.
Huskins, C. W.; and Swift, L. J.
Food Res. 18(3): 305-307. 1953.

The analytical data on the composition of the lipids from fresh orange juice and from the same juice almost immediately after pasteurization was compared. Comparative analysis of the lipid from fresh and pasteurized orange juices showed little change in composition. A slight loss of unsaponifiable matter was noted. It appears unlikely that changes in flavor and lipid composition, due to pasteurization, are closely related.

89. EFFECT OF HEAT TREATMENT TEMPERATURE ON THE STORAGE LIFE OF VALENCIA ORANGE CONCENTRATES.
Bissett, O. W.: Veldhuis, M. K.; and Rushing, N. B.
Food Technol. 7(6): 258-260. 1953.

Complete heat stabilization of the cloud in single-strength orange juice, 2-fold, and 4-fold concentrates was attained at 190° F. and 200° F., while 160° F. was sufficient for 6-fold concentrates. Products processed at 160° F. or above were not subject to can swelling during storage at either 35° F. or 80° F. Viable organisms decreased rapidly with increasing treatment temperature up to 150° F., while at higher temperatures decreases in count were not so great for each increase

in treatment temperature. Pectinesterase activity was sharply reduced by treatment temperatures of 120° to 150° F., was not appreciably changed between 150° F. and 180° F., and was reduced to very low activity by treatments of 190° F., and 200° F.

88. ULTRASONIC TREATMENT OF ORANGE JUICE PRODUCTS.
Kew, T. J.
Fla. State Hort. Soc. Proc. 65: 242-246. 1952.

The applicability of ultrasonic energy to the processing of orange juice was investigated. Gel structure in orange concentrate was destroyed, but cloud was not dispersed. The activity of the enzyme pectinesterase in orange juice products was not affected by ultrasonic treatment. In orange juice vitamin C was not destroyed by the treatment, nor was the color impaired. Off-flavor and off-odor developed in reconstituted orange juice and in orange concentrate.

87. COLIFORM BACTERIA FROM ORANGE CONCENTRATE AND DAMAGED ORANGES.
Patrick, R.
Food Technol. 7(4): 157-159. 1953

Evidence is presented to show that of 217 coliform cultures obtained from orange concentrate and damaged oranges and grouped in accordance with their IMVIC test reactions, 64% were Escherichia coli types, 19% were Aerobacter aerogenes types, and 17% were intermediate types. Of the E. coli types 41% gave IMVIC patterns considered of sanitary significance.

86. REDUCTION OF ORGANIC MATTER IN CITRUS PRESS LIQUOR BY AERATED YEAST PROPAGATION.
Veldhuis, M. K.
Citrus Indus. 33(9): 11-12. 1952. Also in Engin. Progress Univ. Fla. 6(10): 24-26. 1952. (Fla. Engin. & Indus. Expt. Sta. Bull. Ser. No. 57.)

The yeast, Torulopsis utilis, under a continuous method of propagation, was found to complete depletion of sugars in citrus press liquors within a detention time of 2.5 to 3 hours under a wide range of conditions. It was found, however, that under some conditions substantial quantities of volatile materials (alcohols and esters) may be formed. Yeast propagation rapidly utilized the sugars which constitute about two-thirds of the soluble solids in citrus press liquor. The remaining organic materials consist mainly of pectin, pectic degradation products, glycosides (naringin and hesperidin), and salts of citric acid.

85. CONSTITUTION OF THE LIPID FROM STORED FLORIDA VALENCIA ORANGE JUICE.
Huskins, C. W.; Swift, L. J.; and Veldhuis, M. K.
Food Res. 17(2): 109-116. 1952.

In lipids obtained from stored pasteurized Florida Valencia orange juice, the ratio of phosphorus to nitrogen was 1 to 2. Conjugated fatty acids increased while nonconjugated acids decreased, and considerable breakdown occurred in the lipid fraction during storage. The resin acids contained phthalic acid, whereas this acid was not found in freshly pasteurized juice lipid. From the analyses obtained, it would be difficult to predict the state of the lipid after storage.

84. FLAVOR CHANGES IN STORED CANNED ORANGE JUICE.
Swift, L. J.
Fla. State Hort. Soc. Proc. 64: 181-185. 1951

Two theories to account for the development of off-flavor in canned orange juice on storage were investigated: that off-flavors are due to changes in the d-limonene of the peel oil; and that they are due to changes in the lipid constituents of the juice. At the present stage, peel oil was indicated as a source of the typical storage flavor and lipid constituents may also play a role. Further work is in progress.

83. ISOLATION OF BETA-SITOSTERYL-D-GLUCOSIDE FROM THE JUICE OF FLORIDA VALENCIA ORANGES (CITRUS SINENSIS, L.)
Swift, L. J.
Amer. Chem. Soc. Jour. 74(4): 1099-1100. 1952.

The aim was to identify the components of the steryl glycoside occurring in orange juice. Structure was determined by identifying component parts and derivatives. Glucose was identified by qualitative and quantitative determinations. The beta-sitosterol was identified via the acetate and benzoate. The tetraacetate and tetrabenzoate of beta-sitosterol-D-glucoside were also prepared.

82. SPRING HOLDER FOR CAPILLARY-MELTING-POINT TUBES.
Swift, L. J.; and Bissett, O. W.
Chem.-Anal. 41(2): 44. 1952.

The holder is made of sheet brass and grips the thermometer stem by spring tension. As many as 5 capillary tubes may be inserted at one time.

81. FATTY ACIDS OF THE LIPIDS FROM FRESHLY CANNED FLORIDA VALENCIA ORANGE JUICE.
Swift, L. J.
Food Res. 17(1): 8-14. 1952.

An analysis of the methyl esters of the fatty acids of freshly canned Florida Valencia orange juice was made by the spectrophotometric method for the overall examination, and by application of distilled fractions for the saturated and palmitoleic esters. A considerable discrepancy was found in the percentages of saturated esters by the two methods.

80. THERMAL CONDUCTIVITY IN ORANGE CONCENTRATE.
Morgan, D. A.
Fla. State Hort. Soc. Proc. 64: 192-198. 1951.

The equations of unsteady state heating or cooling can be applied to 58.9° Brix orange concentrate for prediction of heating or cooling times, and also to the 42° Brix concentrate above its freezing point. The average value for the coefficient of thermal conductivity for 58.9° Brix concentrate was found to be 0.17 B.t.u./hr./sq.ft./°F./ft.; and for 42° Brix concentrate it was 0.18 B.t.u./hr./sq.ft./°F./ft.

79. SOURCES OF COLIFORM BACTERIA IN CITRUS JUICE FOR CONCENTRATES.
Patrick, R.
Fla. State Hort. Soc. Proc. 64: 178-181. 1951.

Possible sources of coliform bacteria in citrus juice concentrates were water for washing the fruit; exteriors of the fruit; the fruit juice itself; scale insects; and fruit flies (Drosophila). The presumptive coliform tests and plate counts, which are given for 9 groups of samples, showed that coliforms were found on the exteriors of fruit infected with scale insects; in juice from damaged fruit; and from fruit flies in significant numbers.

78. HYGROSCOPIC CHARACTERISTICS OF DRIED CITRUS PULPS CONTAINING CITRUS MOLASSES.
Bissett, O. W.; and Veldhuis, M. K.
Feedstuffs 23(36): 26, 28, 30, 31. 1951.

Dried citrus pulps with varying citrus molasses content were prepared and subjected to relative humidities from 40 to 80%. The relative humidity was the predominating factor, although somewhat higher moisture contents accompanied higher molasses content. No samples showed mold growth at 70% relative humidity and all samples molded at 80% humidity. Results indicate dried citrus pulp with added molasses can be handled in the same manner as dried citrus pulp alone.

77. *STORAGE TEMPERATURE EFFECTS ON FROZEN CITRUS CONCENTRATES.
DuBois, C. W.; and Kew, T. J.
Refrig. Engin. 59(8): 772-775, 812. 1951.

Commercial frozen citrus concentrates of orange, grapefruit, tangerine, and blended grapefruit and orange juices were stored at various temperatures and examined periodically. No consistent changes in viscosity were found. Bacteriological counts dropped rapidly in all instances. Cloud loss, changes in flavor, and can condition were also considered. Results showed that temperature and time of storage are important factors in maintaining stability and acceptability of such concentrates.

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* In cooperation with Minute Maid Corp., Plymouth, Fla.

76. CHEMISTRY AND TECHNOLOGY OF CITRUS.
Veldhuis, M. K.
USDA Yearbook of Agr. 1950/51: 263-267. 1951.
Citrus Indus. 32(8): 7-9. 1951.

Developments since 1936 in the technology of the canning of citrus fruits have transformed them from a rarity to one of our most common foods. Citrus products discussed are pasteurized single-strength juices; concentrated pasteurized juices; frozen single-strength juices; frozen concentrates; frozen citrus purees; powdered orange juice; and canned and frozen citrus sections. The processes for manufacturing each of these products are described.

75. *MAKING USE OF TONS OF CITRUS WASTE.
Owens, H. S.; Veldhuis, M. K.; and Maclay, W. D.
USDA Yearbook of Agr. 1950/51: 268-274. 1951.

Useful products such as dried pulp, molasses, pectin, essential oils, brined peel, citric acid, limonene, feed yeast, and biologically active materials made from citrus canning plant residue, are discussed. Special processes and equipment for their manufacture, and some of the uses to which they can be put are described.

74. CONSTITUTION OF THE JUICE LIPIDS OF THE FLORIDA VALENCIA ORANGE (CITRUS, SINENSIS L.).
Swift, L. J.; and Veldhuis, M. K.
Food Res. 16(2): 142-146. 1951.

The lipid material of Florida Valencia orange juice has been isolated and approximate analysis has been made. The particular

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* In cooperation with Western Regional Research Laboratory, Albany, Calif.

sample isolated contained about one-third phosphatides in spite of the fact that the extraction was made with acetone. The percentage of unsaponifiable matter was considerably lower than has been found on earlier samples, an indication that the lipid constitution is subject to considerable variation.

73. CITRUS JUICE AND REMOVAL OF VOLATILE OILS THEREFROM.
Pulley, George N.; and Veldhuis, Matthew K.
U. S. Patent No. 2,510,138; June 6, 1950.
(Available from U. S. Patent Office, Washington, D.C., 25¢ per copy.).

The patent covers a method of simultaneously pasteurizing juice and removing volatile oils therefrom. The juice is heated to boiling at substantially atmospheric pressure and from 0.5 to 5% of the juice vaporized. The efficiency of deoiling is improved by maintaining the juice and vapors in intimate contact for at least 3 seconds.

72. A METHOD FOR ESTIMATING SOLUBLE SOLIDS IN DRIED CITRUS PULP.
Bissett, O. W.
Fla. State Hort. Soc. Proc. 63: 174-179. 1950.

The method consists essentially of boiling a 25 g. sample of pulp in 200 gs. of water for 20 minutes, cooling, replacing the water lost during heating, stirring for two minutes, filtering through a dry filter aid pad, determining the soluble solids by refractometer or spindle, and multiplying by nine. The method was demonstrated on 23 samples of pulp. It is simple, rapid, and suited to routine use in a citrus feed mill.

71. AN INDEX OF PASTEURIZATION OF CITRUS JUICES BY A RAPID METHOD OF TESTING FOR RESIDUAL ENZYME ACTIVITY.
Kew, T. J.; and Veldhuis, M. K.
Fla. State Hort. Soc. Proc. 63: 162-165. 1950.

This test is based on the activity of the pectinesterase enzyme. Conditions are made favorable for high activity of this enzyme, the pH adjusted with methyl red and observations made for changes in pH. The activity can be detected in unpasteurized juices in ten minutes and in borderline samples in 4 hours. An increase in acidity as indicated by the methyl red is considered a positive test. If the samples are then allowed to stand overnight in a refrigerator, a gel forms that can easily be seen if the enzyme has not been inactivated.

70. *CITRUS CANNERY WASTE, ITS USE AND DISPOSITION.
Von Loesecke, H. W.
U. S. Bur. Agr. Indus. Chem. AIC-290, 18 p. Processed. November 1950.

This publication reviews the processing of citrus cannery waste, such as peel and pulp, for various uses, including dried pulp or ensilage for livestock and poultry feed, and other products from peel; citrus molasses; press liquor; oil from seeds; and disposal of cannery effluents. There are 65 references.

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* Utilization Research, Agricultural Research Service, USDA Washington, D. C.

69. MICROBIOLOGICAL SURVEYS OF CITRUS PROCESSING PLANTS DURING THE 1948-49 SEASON.
Patrick, R.
U. S. Bur. Agr. Indus. Chem. AIC-259, 19 p. Processed. March 1950.

A survey of total counts was conducted, using four media; these media were rated on the basis of numbers only after many plants were investigated during the season. Unwashed fruit that was not over-mature and had been promptly diverted to the processing plants did not constitute a major sanitary problem for the operator. Washing reduced the peel contamination. Clean equipment, short holding time of the product, and handling at low temperatures enabled an operator to obtain a low count. Slush freezing of concentrate usually produced an apparent increase in numbers. Buffering the reconstituted juice previous to plating did not increase the count.

68. THE ROLE OF MICRO-ORGANISMS AND STORAGE TEMPERATURES ON THE QUALITY OF ORANGE CONCENTRATE.
Patrick, R.
Fla. State Hort. Soc. Proc. 62: 174-177. 1949.

Microbiological examinations were made of samples of frozen orange concentrate from each of the Florida plants producing this product during the 1948-49 season. Numbers of viable organisms were determined by plating on four different media in most cases, and on five media in a few cases. Results show that frozen concentrate stored at the higher temperature (42°), corresponding to ordinary refrigerator temperatures, will be much more susceptible to rapid spoilage. In a few

samples, substantial numbers of organisms remained viable at cold (42°) and frozen (0°) storage. The cloud was destroyed in all of the samples stored at the higher temperature whereas this clarification was not shown by samples stored at zero.

67. FROZEN PUREES FROM FLORIDA CITRUS FRUITS.
Bissett, O. W.
Fla. State Hort. Soc. Proc. 62: 163-165. 1949.

Citrus purees were prepared from a number of varieties of citrus fruits. Valencia oranges are recommended particularly for use in preparing orange sherbet. Purees were made by quartering the fruit and passing it through a screw type finisher of 0.027 in. perforations. The finisher removed the seeds and most of the pulp and yielded a juice containing about 1% peel oil. Since it is high in peel oil, puree is excellent as a flavoring material.

66. TANGERINE SEED OIL.
Swift, L. J.
Amer. Oil Chem. Soc. Jour. 26(8): 438-441. 1949.

An analysis of tangerine seed oil was made and chemical and physical properties presented. Evidence for the presence of linolenic, linoleic, oleic, palmitic, stearic, arachidic, and an unidentified hydroxy acid was obtained and the percentages of these acids were determined.

65. *THE COMPOSITION OF FLORIDA CITRUS MOLASSES.
Royo, Iranzo, J.; and Veldhuis, M. K.
Fla. State Hort. Soc. Proc. 61: 205-211. 1948.
Citrus Indus. 30(4): 3, 15, 18, 19, 22. 1949.

Thirteen samples of citrus molasses were analyzed and the following average values were obtained: 71.37° Brix by refractometer, 72.28° Brix by spindle (dilution method), 70.43% total solids, 42.09% total sugar (calculated as invert), 22.44% reducing sugar (calculated as invert), 3.81% protein, 1.07% pectin (alcohol precipitate), pH 4.68, 0.64% total acidity, 0.053% volatile acidity, 4.77% ash, 29.84% Ca in ash, and 2.14% Mg in ash. Viscosities were determined, and the Maerz and Paul color values are given.

64.**METHOD OF PREPARING FULL-FLAVORED FRUIT JUICE CONCENTRATES.
MacDowell, Louis G.; Moore, Edwin L.; and Atkins, Cedric D.
U. S. Patent No. 2,453,109; Nov. 9, 1948.
(Available from U. S. Patent Office, Washington, D. C., 25¢ per copy.)

The basic patent covering the process of manufacture of frozen concentrated citrus juices is assigned to the Secretary of Agriculture. The steps of concentrating at a temperature below 80° F. (to prevent flavor damage) to 5- to 8- fold, diluting to 3- to 4-fold concentration with fresh deaerated juice (cutback juice) to restore the original aroma, flavor and palatability, packing under vacuum and freezing are explained.

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* In cooperation with Spanish Government Research Fellow.

** In cooperation with Florida Citrus Commission.

63. ASCORBIC ACID LOSSES AND DARKENING ON STORAGE AT 49° C. (120° F.) OF SYNTHETIC MIXTURES ANALOGOUS TO ORANGE JUICE.
Curl, A. L.
Food Res. 14(1): 9-14. 1949.

Ascorbic acid losses and darkening were measured in thirteen synthetic solutions analogous to orange juice on storage in enamel and plain tin cans at 120° F. for 30 and 60 days. Considerable losses of ascorbic acid were observed in the presence of buffer only, and somewhat greater losses in the presence of sugars. Darkening occurred mainly in the presence of both sugars and amino acids.

62. GAS FORMATION IN CONCENTRATED ORANGE JUICE AND ANALOGOUS SYNTHETIC MIXTURES.
Curl, A. L.
Food Res. 13(5): 381-386. 1948.

The formation of gas in concentrated orange juice and analogous synthetic mixtures on storage at 120° F. was studied. Addition of ascorbic acid markedly increased gas production. Added amino acids had less effect. Synthetic mixtures containing sugars evolved no gas. Similar mixtures containing also 0.2% ascorbic acid evolved small amounts of gas; when compounds of metal having more than one valence, such as Sn and Cu, were added to this mixture, the gas production was considerably greater. Mixtures containing dextrose or levulose plus 2% ascorbic acid evolved considerable gas. Mixtures containing sugars plus ascorbic acid plus amino acids yielded gas in a quantity about the same as in concentrated orange juice.

61. THE COMPOSITION OF THE SUGARS IN FLORIDA VALENCIA ORANGE JUICE.
Curl, A. L.; and Veldhuis, M. K.
Fruit Prod. Jour. 27(11): 342-343, 361. 1948.

Evidence for the presence of sucrose and invert sugars as the principal sugars in Florida Valencia concentrated orange juice was obtained by a comparison of chemical and polarimetric data. Averaging the six samples, 50.5% of the total sugar content was estimated as sucrose, 23.7% as dextrose, and 25.8% as levulose. The results are in approximate agreement with those of previous investigators with oranges from other regions.

60. BACTERIOLOGICAL SURVEY OF SOME CITRUS CANNERIES IN FLORIDA WITH SPECIAL ATTENTION TO ESCHERICHIA COLI.
Patrick, R.
Fla. State Hort. Soc., Proc. 60: 36-38. 1947.

Samples of fresh juice from 10 citrus canning plants were collected over a period of 3 years and plated on eosin methylene blue agar. Typical sheen producing colonies were checked by the IMVIC tests. No cultures gave a test pattern typical of E. coli.

59. EXPERIMENTS ON PRODUCTION OF FEED YEAST FROM CITRUS PRESS JUICE.
Veldhuis, M. K.; and Gordon, W. O.
Fla. State Hort. Soc. Proc. 60: 32-36. 1947.

Studies on the adaptation of the continuous method developed at the Southern Regional Research Laboratory are discussed. It was demonstrated that continuous operation over extended periods of time was possible without loss of activity of the culture of Torulopsis utilis. Approximately 500 cubic feet of air were required per pound of dry yeast produced. Sugars were reduced by 95%, total organic matter 65%, and B.O.D. 80% in the propagator. Ammonium sulfate and trisodium phosphate were the added nutrients.

58. *AN EXPERIMENT ON PARTIAL CONCENTRATION AS A MEANS OF STANDARDIZING LOW-SOLIDS ORANGE JUICE.
Moore, E. L.; MacDowell, L. G.; Atkins, C. D.; and Huggart, R. L.
Fruit Prod. Jour. 27(3): 72-74. 1947. (Reprints not available).

Packs of Hamlin orange juice as extracted (7.43° Brix), concentrated to 10.65° Brix, and with concentrate added to 10.70° Brix were put up in plain tin cans, and examined initially and after 3 and 6 months storage. The different methods of preparation gave no significant differences in ascorbic acid retention during either of the storage periods. After 3 months storage at 80° F., samples were submitted to 39 commercial canneries for flavor evaluation and tasted by 210 people. There were no marked differences in preference between the concentrated and concentrate-added packs but a marked preference for either in comparison to the control pack. The flavor of the early-season, low-acid orange juice was materially improved either by concentration or addition of some concentrate.

57. CONCENTRATED ORANGE JUICE STORAGE STUDIES. THE EFFECTS OF DEGREE OF CONCENTRATION AND TEMPERATURE OF STORAGE.
Curl, A. L.
Canner 105(13): 14-16, 38, 40, 42. 1947.

Seven batches of orange juice, varying in concentration from 13 to 71% soluble solids, were prepared from one lot of Indian River Valencia oranges. The juices, packed in citrus-enamel cans, were stored at 40°, 60°, 80°, 100°, and 120° F. for periods up to 12 months. Each pack at each storage temperature was

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examined 5 times, including an initial analysis, for vacuum or pressure in the can, ascorbic acid, total and reducing sugars, and color (of the filtered reconstituted juice). Flavor ratings were made of the reconstituted juices. In general, the higher the storage temperature and the more concentrated the product, the more rapid the deterioration as represented by these factors.

56. COMPARISON OF SEVERAL TYPES OF APPARATUS DEVISED FOR THE DETERMINATION OF VOLATILE OIL IN CITRUS JUICES.
Curl, A. L.
Assoc. Off. Agr. Chem. Jour. 30(3): 567-575. 1947.

Design and dimensions of apparatus for the determination of peel oil in citrus juices by distillation are important in convenience and accuracy of the determinations. A new-type apparatus was compared with two types in common use and shown to be as accurate as the Wilson apparatus and to permit more rapid operation than either the Wilson or Clevenger. Speed of operation was increased by employing a micro-buret, so that a 500 ml sample of juice may be used.

55. THE ORIGIN OF THE OFF-FLAVOR WHICH DEVELOPS IN PROCESSED ORANGE JUICE.
Curl, A. L.; and Veldhuis, M. K.
Fruit Prod. Jour. 26(11): 329-330, 342. 1947.

A study of 18 experimental packs of orange juice in glass containers was made in order to obtain more information on the origin of the off-flavor which develops on storage at room temperature. The fraction responsible for the major part of the off-flavor was found to be the suspended material, which includes the lipid or fatty fraction. Filtered juices developed

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some off-flavor on storage at 80° F., but the change was much less than in whole juices and quite different in character. Peel oil was not responsible for much, if any, of the off-flavor; in some cases it appeared to mask the off-flavor instead. Reconstituted orange juice concentrates and a juice pressed from peeled fruit developed about as much off-flavor as juice from unpeeled fruit. The water-soluble ester or essence fraction had little or no effect on the development of the off-flavor.

54. *INDUSTRIAL WASTES - CITRUS CANNING INDUSTRY.
McNary, R. R.
Indus. and Engin. Chem. 39(5): 625-627. 1947. (Reprints not available)

Changing conditions in the citrus industry and effects on waste disposal are reviewed. In ten years the percentage of the grapefruit crop precessed has increased from 22% to 69% and of oranges from 1.4% to 38.5%. The peel is used principally in the manufacture of dried citrus pulp and citrus molasses. The disposal of waste water from citrus canneries poses a difficult problem.

53. *CONCENTRATED ORANGE JUICE STORAGE STUDIES WITH PARTICULAR REFERENCE TO THE DEVELOPMENT OF SWELLS.
Curl, A. L.; Moore, E. L.; Wiederhold, E.: and Veldhuis, M.K.
Fruit Prod. Jour. 26(4): 101-109, 121. 1946.

Pasteurized, unpasteurized, and benzoated concentrated orange juices of about 65° Brix were stored at 40°, 80°, 95°, and 120° F. In one unpasteurized pack fermentation developed and

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cans swelled in four or five days at 80° and 95° F. In other cans at these temperatures swells developed more slowly. No swelled cans were noted in 12 months storage at 40° F. Swelled cans developed within two weeks at 120° F., three months at 95° F. and six months at 80° F. Data on microbial counts, darkening, ascorbic acid content, sugar inversion, and flavor during storage are included.

52. THE DETERMINATION OF CRUDE LIPID IN CITRUS JUICES.
Swift, L. J.
Assoc. Off. Agr. Chem. Jour. 29(4): 389-395. 1946.

A method was devised that is suited to routine laboratory work. The lipids are separated from the juice by filtration using disintegrated filter paper as a filter aid. After washing, the paper pulp and lipid are transferred to a Soxhlet extractor and extracted with acetone and petroleum ether. The solvents are dried and evaporated and the residue weighed.

51. OFF-FLAVOR DEVELOPMENT IN PROCESSED TANGERINE JUICE.
Curl, A. L.
Fruit Prod. Jour. 25(12): 356-357. 1946.

A study of experimental packs revealed that it is possible to can tangerine juice of good quality, with a stability similar to orange juice. Exclusion of peel and pulp extractives seemed to be an important factor. In properly prepared juices, the suspended matters appeared to be responsible for a major portion of the off-flavor developed. Peel oil seemed to mask off-flavor development.

50. CITRUS FRUIT PRODUCTS RESEARCH.
Veldhuis, M. K.
Fla. State Hort. Soc. Proc. 58: 51-55. 1945. (Reprints not available).

The previous year's work of the Station is reviewed. Recent investigations on gas formation in concentrated orange juice stored at room temperature, low-temperature frozen citrus concentrates, method of estimation of peel oil in citrus juices, lipids in citrus juices, bacteriological problems, tangerine products, powdered citrus juice, and flavor recovery are discussed.

49. *THE CONCENTRATING AND DRYING OF CITRUS JUICES.
Moore, E. L.; Atkins, C. D.; Wiederhold, E.; MacDowell, L.G.; and Heid, J. L.
Inst. Food Technol. Proc. 1945: 160-168. (Reprints not available).

Drying by sublimation, vacuum drying, spray drying, concentration by evaporation, concentration by crystallization and frozen orange juice concentrate are discussed in this review.

48. *A NOTE ON OBSERVATIONS ON RETARDING DEVELOPMENT OF CHANGES IN FLAVOR AND COLOR OF GLASS PACKED GRAPEFRUIT JUICE.
Wiederhold, E.; Moore, E. L.; and Atkins, C. D.
Fruit Prod. Jour. 25(4): 104-105. 1945. (Reprints not available).

Preliminary investigations indicate the possibility that a brief period of cold storage at 32-40° F. immediately after packing might have some beneficial effect on the retention of color and flavor of glass-packed grapefruit juices after they are brought out to room temperature. The results of the examination of experimental packs are described.

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47. *VITAMIN C CONTENT OF PROCESSING RESIDUE FROM FLORIDA CITRUS FRUITS.
Atkins, C. D.; Wiederhold, E.; and Moore, E. L.
Fruit Prod. Jour. 24(9): 260-262, 281. 1945. (Reprints not available).

Four varieties of Florida oranges and two of Florida grapefruit were analyzed to determine the content of vitamin C and its distribution in the fruit. About three-fourths of the vitamin was contained in the peel and rag of the fruit and about one-fourth in the juice. Preliminary experiments indicated that the peel-and-rag residues remaining after extraction of the juice retain relatively high vitamin C content, and may be considered as a potential source of this vitamin.

46. *FLAVOR AND ASCORBIC ACID RETENTION IN FRESH FLORIDA CITRUS JUICES.
Moore, E. L.; Atkins, C. D.; Wiederhold, E.; and MacDowell, L. G.
Jour. Home Econ. 37(5): 290-293. 1945. (Reprints not available).

Investigations indicate that the length of time freshly extracted orange juice or grapefruit juice may be allowed to stand before use in the home is limited by loss of palatability and the beginning of fermentation, not by appreciable ascorbic acid losses. Machine and hand-reamed juices were kept in covered and uncovered containers at 40° and 70° F. for periods up to one week. At 40° F. the ascorbic acid retention ranged from 96.2 to 99% during the week. Samples at 70° F. retained from 97.2 to 98.5% of the vitamin C for three days and then had to be discarded because of excessive fermentation.

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45. *ASCORBIC ACID RETENTION IN FLORIDA GRAPEFRUIT JUICES. III. AS RELATED TO INDIVIDUAL FACTORS OF CANNING PLANT OPERATION.
Wiederhold, E.; Atkins, C. D.; and Moore, E. L.
Canner 100(23): 12-14, 23. 1945. (Reprints not available).

The retention of vitamin C was found to be related to methods used in preparing the commercial juices. Good retention of vitamin C was observed when copper or other metals that might catalyze the oxidation of ascorbic acid were absent, the incorporation of unnecessary air in the juice was avoided, there was thorough deaeration of the juice, tubular pasteurizers were used instead of kettle-type pasteurizers, there was good vacuum in the can and a minimum of headspace, and the cans had been stored at a cool temperature, e. g. 40° F.

44. *THE CITRUS CANNING WASTE DISPOSAL PROBLEM IN FLORIDA.
Ingols, R. S.
Sewage Works Jour. 17(2): 320-329. 1945. (Reprints not available).

Disposal of liquid citrus canning wastes is discussed. The liquid wastes of canning plants are rather dilute and primarily a sanitary disposal problem. Descriptions are given of the methods in use and others that could be used. The liquid waste from the cattle-feed plants is a press liquor containing about 10% solids. Methods for disposing of this liquor and for manufacturing several products are described. The results of a pilot plant study of citrus canning plant wastes showed that it should be possible to treat the concentrated wastes from juicing plants.

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43. *ASCORBIC ACID RETENTION IN FLORIDA GRAPEFRUIT JUICES. II. DURING STORAGE OF THE CANNED PRODUCTS.
Moore, E. L.; Wiederhold, E.; and Atkins, C. D.
Canner 100(8): 55-57. 1945. (Reprints not available)

Samples of canned grapefruit juices from 12 commercial canning plants were obtained and stored at room temperature. The average room temperature was 78° F. Average retention of vitamin C was 95% at the end of 2 months, 90% at the end of 4 months and 83% at the end of 6 months storage.

42. *INVESTIGATION ON CITRUS FRUIT PRODUCTS.
Veldhuis, M. K.
Fla. State Hort. Soc. Proc. 57, 51-55. 1944. (Reprints not available)
Citrus Indus. 26(1): 6-7, 15, 18, 1945.

The results of studies conducted during the year are discussed. Included are tangerine products, concentrated orange juice, powdered citrus juices, retention of vitamin C during canning and storage, a comparison of orange and grapefruit juices in tin and glass containers, disposal of liquid citrus plant wastes, and crude citrus pectin.

41. *A SECOND YEAR OF CITRUS RESEARCH ON BYPRODUCTS AND PROBLEMS OF THE CITRUS CANNING AND CONCENTRATING INDUSTRY IN FLORIDA.
Anonymous.
Fruit Prod. Jour. 24(3): 71-73. 1944.
Citrus Indus. 25(11): 6-8. 1944. (Reprints not available)

This paper reviews the year's work of the Florida Citrus Commission Research Fellows at the U. S. Citrus Products Station. Investigations on concentrated and powdered juices, glass- and

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tin-packed orange and grapefruit juices, retention of vitamin C in grapefruit juice during commercial canning, recovery of cold-pressed peel oil, beverage bases, citrus pomace, and distribution of vitamin C in citrus fruit are discussed.

40. PAPAYA PRODUCTS.
Heid, J. L.; and Curl, A. L.
Fruit Prod. Jour. 24(2): 41-44, 53. 1944.

Selected varieties of papayas are flavorful, have smooth texture, high content of provitamin A and vitamin C, and are suitable for processing. Methods for preparation of acceptable products by dehydration, canning, pickling, and preserving are described. Dehydrated papaya is believed to be suitable for incorporation in confections and in concentrated food rations.

39. *UTILIZATION AND DISPOSAL OF CITRUS PROCESSING RESIDUES.
Ingols, R. S.
Fla. State Hort. Soc. Proc. 57: 28-31. 1944. (Reprints not available).

Methods of utilization and disposal are reviewed. Plans are discussed for a small experimental biological reaction tank in which the wastes are to be held for 24 to 30 hours. It is anticipated that three-fourths of the organic matter will be destroyed during the treatment.

38. *THE RECOVERY OF FLAVORING OIL FROM PERSIAN LIMES--PRELIMINARY EXPERIMENTS.
Atkins, C. D.; Wiederhold, E.; and Heid, J. L.
Fruit Prod. Jour. 23(10): 306-308. 1944. (Reprints not available)

Preliminary tests were made on the quantity of oil present in and obtainable from cull Persian limes. Cold pressed lime oil

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was obtained by use of a tapered-screw press and a laboratory model centrifuge. The whole fruit contained 0.32% oil and 0.11 and 0.095 pounds of oil were obtained respectively in two tests. The cold-pressed oil obtained thus constituted about one-third that in the fresh fruit. The properties of the oil were determined.

37. A COMPARISON OF METHODS FOR THE DETERMINATION OF MOISTURE IN DEHYDRATED VEGETABLES.
Curl, A. L.
Canner 98(23): 22-23. 1944.

The benzene distillation, toluene distillation, and vacuum oven methods of estimating moisture were compared for 12 kinds of vegetables. The results indicated that the benzene method is acceptable for all vegetables tested except white potatoes where the toluene procedure is preferable.

36. *CHANGES OCCURRING IN ORANGE AND GRAPEFRUIT JUICES DURING COMMERCIAL PROCESSING AND SUBSEQUENT STORAGE OF THE GLASS-AND TIN-PACKED PRODUCTS.
Moore, E. L.; Wiederhold, E.; and Atkins, C. D.
Fruit Prod. Jour. 23(9); 270-275, 285. 1944. (Reprints not available)

Ascorbic acid retention in orange and grapefruit juices during processing averaged 98-99%. Apparently the slower cooling of the bottled juices did not lower the vitamin retention, but a slight cooked flavor was noted in comparison with canned juices. The retention of vitamin C was somewhat less in glass containers when stored at room temperature, but was still considered good at the end of 6 months. After 6 months storage, orange juices

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in tin and glass were off-flavor, with the bottled juice slightly better in taste. Bottled grapefruit juice became unpalatable during this period, but the canned juice was still satisfactory.

35. *GRAPEFRUIT CANNERY WASTE YIELDS CRUDE CITRUS PECTIN.
Pulley, G. N.; Moore, E. L.; and Atkins, C. D.
Food Indus. 16(4): 285-287, 327-328. 1944.

A method of preparing dried citrus pomace from grapefruit peel is described. Enzymes were inactivated and most of the soluble material removed by boiling the ground peel for 5 to 7 minutes. The peel was then leached with several changes of cold water, pressed to remove excess water, and dried to 4-8% moisture content. The addition of aluminum sulfate to the last leach water improved pressing water from the peel. The dried pomace may be used for the preparation of pectin solutions for jam and jelly manufacturing.

34. *TANGERINE JUICE PRODUCTS.
Atkins, C. D.; Moore, E. L.; and Heid, J. L.
Fruit Prod. Jour. 23(5): 132-134, 152, 153, 157. 1944.
(Reprints not available)

Studies on juice canning and on the preparation of bland syrups, filtered beverage base concentrate and unfiltered cloudy beverage base concentrate are described. Bland syrups are considered as having good possibilities. They were prepared by boiling the juice with calcium carbonate, filtering, adjusting the pH to 5.2 by adding citric acid, treating with decolorizing carbon, and concentrating under vacuum.

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33. *ASCORBIC ACID RETENTION IN FLORIDA GRAPEFRUIT JUICES. I. DURING COMMERCIAL CANNING.
Moore, E. L.; Wiederhold, E.; Atkins, C.D.; and MacDowell, L. G.
Canner 98(9): 24-26. 1944. (Reprints not available)

A survey was made of the ascorbic acid retention in Florida grapefruit juices during commercial canning in 12 Florida canning plants. Equipment was taken into the respective canneries and analyses were made without delay. The results showed an average ascorbic acid retention of 97% during commercial canning.

32. THE UTILIZATION OF FLORIDA FRUITS AND VEGETABLES.
Heid, J. L.
Fla. State Hort. Soc. Proc. 56: 56-59. 1943. (Reprints not available)

31. *CITRUS RESEARCH IN FLORIDA.
Anonymous.
Canner 97(24): 11. 1943 (Reprints not available)

30. *PROGRESS OF EXPERIMENTS IN PACKING FLORIDA CITRUS JUICES IN GLASS.
Moore, E. L.; Atkins, C. D.; and Manzano, M. A.
Canner 96(20): 22. 1943. (Reprints not available)

29. CONCENTRATING CITRUS JUICES BY THE VACUUM METHOD.
Heid, J. L.
Food Indus. 15(5): 62-64, 122; and (6): 64-66, 110-111. 1943.

28. EXPERIMENTS WITH ANTIOXIDANTS FOR PREVENTING FLAVOR DETERIORATION IN CANNED ORANGE JUICE.
Nolte, A. J.; Pulley, G. N.; and von Loesecke, H. W.
Food Res. 7(3): 236-243. 1942.

27. FEED YEAST AND INDUSTRIAL ALCOHOL FROM CITRUS-WASTE PRESS JUICE.
Nolte, A. J.; von Loesecke, H. W.; and Pulley, G. N.
Indus. and Engin. Chem. 34(6): 670-673. 1942.

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Nolte, Arthur J.; and von Loesecke, Harry W.
U. S. Patent No. 2,261,926; November 1941.
(Available from U. S. Patent Office, Washington, D. C. 25¢ per copy).

25. THE FRUIT AND KERNEL OIL OF THE PLUMY COCONUT. (ARECASTRUM ROMANZOFFIANUM).
Pulley, G. N.; and von Loesecke, H. W.
Oil and Soap 18(12): 251-252. 1941. (Reprints not available).

24. THE COMPOSITION OF SOME BEVERAGES AND MEAT TENDERIZERS PREPARED FROM FLORIDA PAPAYAS.
Pulley, G. N.; and von Loesecke, H. W.
Fruit Prod. Jour. 21(2): 37-39, 57, 59, 61. 1941.

23. EXPERIMENTAL TREATMENT OF CITRUS CANNERY EFFLUENT IN FLORIDA.
Von Loesecke, H. W.; Pulley, G. N.; Nolte, A. J.; and Goresline, H. E.
Sewage Works Jour. 13(1): 115-131. 1941.

22. CITRUS FRUIT PRODUCTS.
Chace, E. M.; von Loesecke, H. W.; and Heid, J. L.
USDA Circular No. 577, 47 p. 1940. (Copies not available).

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Nolte, A. J.; and von Loesecke, H. W.
Food Res. 5(5): 457-467. 1940.

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Nolte, A. J.; and von Loesecke, H. W.
Indus. and Engin. Chem. 32(9): 1244-1246. 1940.

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Pulley, G. N.; and von Loesecke, H. W.
Food Indus. 12(6): 62-63, 100-101. 1940.

18. POSSIBILITIES OF PREPARING LACTIC ACID FROM GRAPEFRUIT JUICE.
Nolte, A. J.; and von Loesecke, H. W.
Fruit Prod. Jour. 19(7): 204-205, 216, 220. 1940.

17. TYPES OF ORGANISMS SURVIVING IN COMMERCIALLY PASTEURIZED CITRUS JUICES IN FLORIDA.
Nolte, A. J.; and von Loesecke, H. W.
Food Res. 5(1): 73-81. 1940.

16. GASES IN THE COMMERCIAL HANDLING OF CITRUS JUICES.
Pulley, G. N.; and von Loesecke, H. W.
Indus. and Engin. Chem. 31(10): 1275-1278. 1939.

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Nolte, A. J.; and von Loesecke, H. W.
Amer. Chem. Soc. Jour. 61(4): 889-891. 1939.

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Von Loesecke, H. W.; and Pulley, G. N.
Fruit Prod. Jour. 18(8): 228-230, 249, 251. 1939.

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Pulley, G. N.; and von Loesecke, H. W.
Amer. Chem. Soc. Jour. 61(1): 175-176. 1939.

12. DETERMINATION OF SMALL QUANTITIES OF ANTIMONY IN TARTAR EMETIC SPRAY RESIDUES.
Davidson, J.; Pulley, G. N.; and Cassil, C. C.
Assoc. Off. Agr. Chem. Jour. 21(2): 314-318. 1938.
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11. NOTE ON THE PREPARATION OF A BOTTLERS' STRAWBERRY SIRUP.
Pulley, G. N.; and von Loesecke, H. W.
Fruit Prod. Jour. 17(10): 293. 1938. (Reprints not available)

10. CHARACTERISTICS AND COMPOSITION OF PAPAYA SEED OIL.
Von Loesecke, H. W.; and Nolte, A. J.
Amer. Chem. Soc. Jour. 59(12): 2565-2567. 1937.

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Nolte, A. J.
Fruit Prod. Jour. 16(12): 360-362. 1937.

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Pulley, George N.
U. S. Patent No. 2,060,242; November 1936.
(Available from U. S. Patent Office, Washington, D. C., 25¢ per copy)

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Pulley, G. N.
Food Res. 1(2): 141-144. 1936. (Reprints not available)

6. WINES, BRANDIES, AND CORDIALS FROM CITRUS FRUITS.
Von Loesecke, H. W.; Mottern, H. H.; and Pulley, G. N.
Indus. and Engin. Chem. 28(10): 1224-1229. 1936. (Reprints not available).

5. SOLUBILITY OF NARINGIN IN WATER.
Pulley, G. N.
Indus. and Engin. Chem., Analyt. Ed. 8(5): 360. 1936.

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Von Loesecke, H. W.
Florida Grower 43(1): 5-6. 1935.

3. POSSIBILITIES OF PREPARING ALCOHOLIC CITRUS BEVERAGES.
Von Loesecke, H. W.
Citrus Indus. 15(7): 8-9, 20-21. 1934. (Reprints not available)

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Von Loesecke, H. W.; Mottern, H. H.; and Pulley, G. N.
Indus. and Engin. Chem. 26(7): 771-773. 1934. (Reprints not available)

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Mottern, H. H.; and von Loesecke, H. W.
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Bottler and Packer 7(9): 50, 52. 1933. (Reprints not available)

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